THE BULLETIN
Vol. 64, Special Edition Deepwater Supplement Fall 2002

Dear Alumni, Parents, and Friends of the Coast Guard,

I am pleased to be able to offer you this Special Deepwater Edition of The Bulletin as a supplement to our standard six issues per year. I hope that you will find it informative and useful in the coming months as we all come to better understand the many changes and unique challenges ahead for our Coast Guard.

As you probably know, on June 25th of this year, the Coast Guard awarded the Integrated Deepwater Systems contract to Integrated Coast Guard Systems (ICGS), A joint venture formed by Lockheed Martin and Northrop Grumman Ship Systems. This contract encompasses a wide-ranging, integrated upgrade of many obsolete systems currently in use by the Coast Guard. It will create a variety of tools the men and women of tomorrow's Coast Guard will need to effectively prosecute our many missions. This Special Edition provides the contractor's detailed view of specific platforms and systems they are planning in addition to the mandated National Security Cutter.

This Supplemental Deepwater Edition, prepared by ICGS, is intended to inform and enlighten our members regarding the future of the Coast Guard and its people. Although it was printed and mailed at no expense to the Alumni Association, it certainly fulfills one of the Association's purposes "to advance the professional knowledge of cadets and its members." We hope that you will take the time to read it and perhaps save this copy to review over the coming months and years as this precedent-setting project progresses.

I'll be in touch!

Wayne R. Gronlund '69
Captain, U. S. Coast Guard (Retired)
President, USCGA Alumni Association, Inc.

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Mailing Address: *The Bulletin*, USCGA Alumni Association, 47 Mohegan Avenue, New London, CT, 06320-8111.
Telephone: (860) 444-8237, Fax: (860) 443-4917, E-mail: cgaeditor@ctol.net

ADDRESS CHANGES

Please contact the Alumni Association staff at the above address or telephone: (860) 444-8237,
Fax: (860) 443-4917, E-mail: cgaalumni@ctol.net, website: www.uscgaaa.onlinecommunity.com

Next mailing of *The Bulletin*: September 27, 2002 (October 2002 issue):

The "Deepwater" Challenge
Integrated Coast Guard System's Approach

RADM M. Edward Gilbert (Ret.) and CAPT Gary R. McGuffin (Ret.)

"A few armed vessels, judiciously stationed at the entrance of our ports, might at a small expense be made useful sentinels of the laws."

Treasury Secretary Alexander Hamilton's vision in the 18th century was the first "Deepwater System" for what would become the United States Coast Guard. More than 200 years later, the Integrated Deepwater System (IDS) seeks to extend Secretary Hamilton's vision and make it cohesive into the 21st Century. The need to modernize the Coast Guard has been well established, and Coast Guard men and women deserve more than the political system has been willing to provide. That appears to have changed as President Bush commented on June 24: "The Coast Guard's Deepwater [Program] will award a multi-year contract to replace aging ships and aircraft, and improve communications and information sharing. *The whole purpose is to push out our maritime borders, giving us more time to identify threats and more time to respond."*

On June 25, 2002, Integrated Coast Guard Systems (ICGS), a joint venture between Lockheed Martin and Northrop Grumman, was awarded the contract to provide and support the Coast Guard's Integrated Deepwater System. This award concluded several years of a highly competitive acquisition, and initi-ated the phase to design, build, implement, manage, and support the IDS for up to 40 years. The Coast Guard, with its ICGS industry partner, is embarking on a long-term relationship unparalleled in government acquisition history. The future performance of the Coast Guard, always under pressure to expand its roles and missions, especially in these times of dynamic national priorities, rests on the future success of Deepwater. Deepwater capability is essential to ensure and maintain Coast Guard presence and response in the coastal (littoral) environment, as well as offshore.

This article will discuss the Coast Guard's approach to procure its future system and how ICGS won the acquisition competition. We will, as background, discuss the context of the Deepwater acquisition, introduce ICGS, and define how ICGS arrived at its proposed solution: the initial building blocks of cutters, boats, aircraft, support, CONOPS and Command, Control, Communications, Computers, Intelligence, Sensors, and Reconnaissance (C4ISR) Systems, that define a "system-of-systems." We will discuss the benefits and some of the impacts of Deepwater and take a quick look at the future. Please note the emphasis on "initial building blocks." While we believe our solution is the right one now, with all its existing opportunities and constraints, the solution is inherently flexible, designed to dynamically evolve with and adapt to changing missions, new technologies, changing national priorities, and budget realities.

What is Deepwater?

The term "Deepwater" has two meanings, depending on the context. Operationally, Deepwater refers to both the coastal and off-shore operating environment, requiring extended on-scene presence or long transit distances. Within the Deepwater regions, the Coast Guard has fourteen operational missions. In this article we will use Deepwater as shorthand for the major long-term acquisition program with its roots in the replacement strategy for the WHEC and WMEC fleets. During the mid-1990's, while developing the required acquisition documents (Mission Analysis Report, Mission Needs

Statement, etc.), the acquisition evolved as several significant considerations were identified. Such considerations include block obsolescence, capability limits, logistical demands, performance gaps, national demands, and budgetary realism.

- *Block obsolescence* of major "legacy" Deepwater assets was not limited to the WHEC and WMEC platforms. Seven of the nine existing classes of Deepwater assets (all white cutters, 110 feet and up, and all aircraft) will reach the end of their planned service lives in the next 15 years.

- Assets designed in a different era, and for different purposes, now have *capability limitations*, especially C4ISR technologies needed for efficient and effective operations. Nearly two-thirds of the operating expense of Deepwater cutters is personnel, and current asset designs afford little opportunity to use technological advances to reduce crew size.

- Additionally, as our assets have aged, *logistical demands* increased, i.e., older systems are becoming unsupportable.

- Extremely important is growth in *performance gaps*. The Coast Guard has tried for years to place an analytical foundation on its performance. Pressure to do even more in this area has been driven by the Government Performance and Results Act (GPRA). The USCG has gained substantial insight into how well it accomplishes its goals, and the results show *existing gaps* in capacity (mission days and re-source hours) that will be exacerbated as the fleet ages. Additionally, several studies foresaw an increasing national demand for Coast Guard services in the 21st Century.

- Finally, budgetary realism is an issue. Historically, the Acquisition, Construction, and Improvement (AC&I) budget averaged $400M-$800M, usually much closer to the lower bound, and Deepwater alone would consume the major portion of that budget. The acquisition strategy had to be a thoughtful and realistic approach to be successful in the budget process. With history as a guide, this effort would certainly take several years to accomplish, thereby implying a long-term major ac-quisition lasting possibly up to 20 years, with support extending well beyond that timeframe.

These, and other factors, prompted a new perspective to re-capitalize the Coast Guard's major assets to balance the relationships among assets, operational effectiveness, cost, changing missions, emerging technology, and logistical support. The Coast Guard chose a capabilities-based acquisition approach based on mission performance. The "specifications" were expressed in terms of more than 200 system-level capabilities, and performance (operational effectiveness) would be evaluated in terms of 66 Measures of Effectiveness (MOEs) across the 14 Deepwater missions. The Coast Guard's Request for Proposal (RFP) stated *"The Government will award to the Offeror whose proposal offers the best value in terms of Operational Effectiveness, Total Ownership Cost, Management Capability and Technical Feasibility . . ."*. There is little question that the acquisition strategy is one of the most innovative and aggressive in the federal government, and its ultimate success will require industry and the Coast Guard to focus their collective resources to design and build a system of assets (system-of-systems) in the environment of total partnership.

This program was divided into two phases: Phase 1 was Conceptual and Functional Design for the IDS, and Phase 2 is the Implementation Phase awarded on 25 June. During the 36 months of Phase 1 of the Deepwater Program, three industry teams developed a series of deliverables to describe their IDS concepts in a competitive environment, with highly structured Coast Guard/ Contractor communications protocol to ensure fairness, and yet, to promote imaginative thinking. The Coast Guard published two capstone acquisition documents for guidance: the

System Performance Specification (SPS) and the Modeling and Simulation Master Plan (MSMP). Simply stated, the SPS described what capabilities the system needed to have, and the MSMP provided the extensive background data on current missions and assets, and described how the future system was to perform against standards. Thus, it would be critical for the evaluation of the operational effectiveness of the industry-proposed *system* concepts.

The Coast Guard provided notional funding profiles for Operating Expense (OE) and AC&I budgets. AC&I funding caps were set at $300 million for the first year and $500 million for each of the following 19 years, and the annual OE cap was just under $1 billion. All these were in Fiscal Year 98 dollars. Within these funding constraints, each of the three industry teams submitted its proposal for Phase 2 in September 2001 to complete detailed design, build, implement, manage, and support their system solution for the contract duration. The four major evaluation factors for the system, in decreasing order of importance, were Operational Effectiveness, Total Ownership Cost, Management, and Technical Feasibility. Risk was a significant subfactor in all four categories, and "Reach versus Risk" became a significant focus for our solution, balancing innovation and the promise of emerging technologies against the challenges and risks associated with attaining performance and cost goals.

What is Integrated Coast Guard Systems (ICGS)?

To meet this acquisition challenge, Lockheed Martin and Northrop Grumman established a joint venture, ICGS. Lockheed Martin and NG's Ingalls Operations have a 30-year history of success in working together to construct and integrate the nation's most advanced and effective naval platforms and ship systems. (Note: Northrop Grumman acquired teammates Ingalls and PRC during the competition phase.) ICGS was selected to be the prime contractor for IDS Phase 2 because it developed the most affordable and effective approach to manage this large-scale, integrated system-of-systems program. The management philosophy is to form a partnership with the Coast Guard to manage the change that will accompany the 20-year transition from today's legacy systems to the new IDS.

ICGS is more than just Lockheed Martin and Northrop Grumman. One of the challenges of a major program with such an extremely broad scope and deep depth is identifying the proper blend of capable industry partners to address the wide variety of expertise and capabilities needed for successful execution. Throughout Phase 1, ICGS implemented the "Open Business Model" to select other companies for expertise and products. The model allows for maximizing competition by minimizing the guarantee of work share to obtain the "best" solution at the most affordable price. As the solution evolved, relationships

The ICGS Team includes:

LOCKHEED MARTIN	NORTHROP GRUMMAN SHIP SYSTEMS
ARINC	LM Management & Data Systems
Bell Agusta Aerospace Corporation	LM Technology Services
Bell Helicopter Textron	M. Rosenblatt & Sons
EADS CASA	Northrop Grumman Full Service Center
EADS Eurocopter	Northrop Grumman IT
Halter-Bollinger	PROSOFT
L3 Communications	United Defense, LP
Whitney, Bradley and Brown	Acquisition Logistics Engineering

changed and new ones more appropriate to the task were formed. To a great extent, however, the core teammates remained intact.

ICGS has the full spectrum of expertise and knowledge about large-scale integration, shipbuilding, aircraft production, and most importantly, about its Coast Guard customer, needed to successfully perform the huge task that lies ahead. Considerable effort was focused on obtaining recently retired Coast Guard personnel to serve in key positions and as consultants. Coupled with continuous out-reach efforts to validate ideas, this ensured the necessary real-world understanding of the Coast Guard and the requirements of the IDS Program.

What Did ICGS Do?

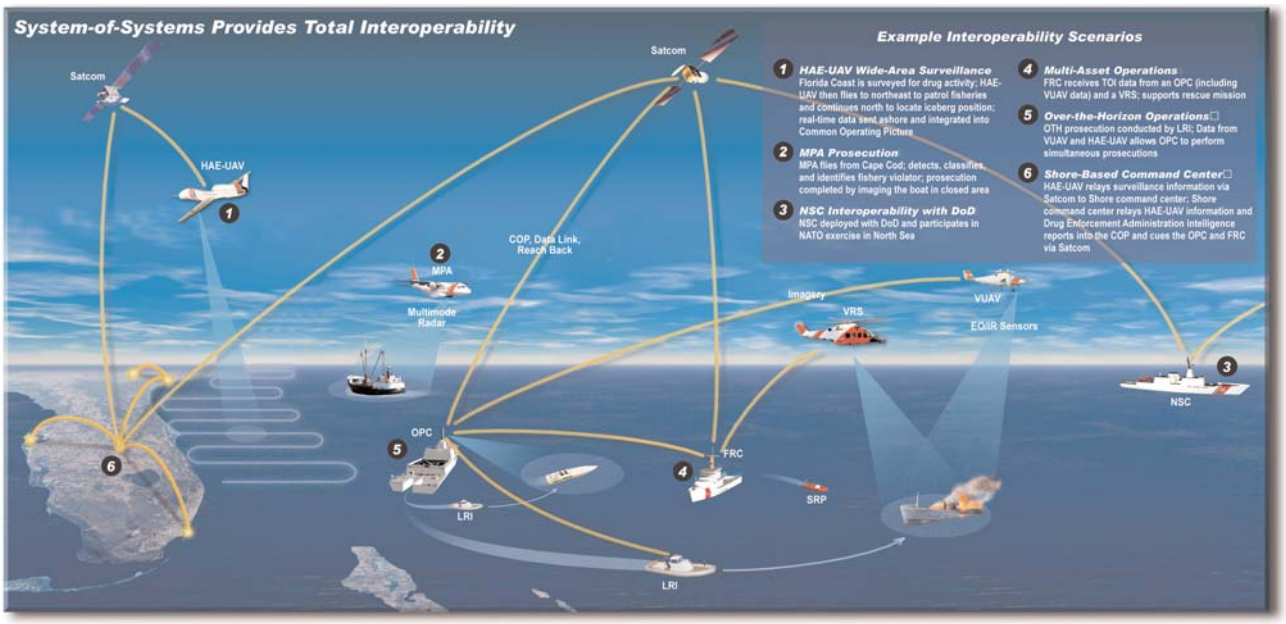
ICGS began pursuing the Coast Guard Deepwater acquisition more than five years ago. Well before the Phase 1 RFP, ICGS started outreach efforts to gather information related to the program and specific customer needs. A small core group of retired Coast Guard personnel was assembled and tasked with a very broad charter: *"Find the best people you can to help us understand the Coast Guard and what it needs. We are determined to win and provide the Coast Guard with the best possible systems, and we believe customer understanding to be critical."*

The group's approach was equally simple, *"Visit everyone and everywhere we can from the mess deck and hangar deck on up, 'squint with your ears' and remember the Coast Guard, like all organizations, is not homogeneous."*

"Factfinding" visits were conducted to operating units, Areas, Districts, as well as support commands and Headquarters. The goal: listen and listen hard, and above all, make no judgments so as to leave the "sandbox" open for all ideas. The visits also gave the group the opportunity to educate our teammates, understand current mission and support demands, and assess current Coast Guard cultural issues. Not only did this fully prepare the ICGS team to respond to the Phase 1 RFP, but they also gained significant customer insight that would be very beneficial as the systems engineering process functioned and deliverables were prepared. We heard many things, some of which help form the foundations for our approach:

- "Boats are my main battery"
- "Don't give me any of that airline-type chow"
- "Give us ships and systems that go to sea well"
- "Give us highly capable assets, if they are good, we have the chance to get more (an area commander)"
- "Few if any of our ships are doing what was planned for them originally; flexibility is key"
- "Military service is a privilege; it need not be a sacrifice, crews deserve comfortable ships that ride well, connectivity to home, good working environments, etc."
- "Don't let support be an afterthought"
- "We, not the enemy, must own the night"
- "Improved intraoperability and interoperability are essential, we've been saying this for years; let's do it"
- "We are getting much better at using intelligence to support our operations, but we can and must do even better"

More than 20 retired Coast Guard personnel participated as part of these outreach efforts, but we are quite aware they represent the past and not the future. We've tried very hard, within the constraints of the acquisition process, to gather information from those people with more current experience, always aware that the acquisition documents formed the basis for the contract award.



Initial deliverables in Phase 1 were a Drivers and Constraints Review, Analysis of Alternatives, and an Affordability Analysis. All were intended to help define the realistic set of alternatives, and focus attention on the issues of greatest significance and impact relating to operational effectiveness and cost.

Communications were done in a competitive environment, yet were sufficiently open to provide each team with the opportunity to develop ideas. Understanding that the legacy assets would likely continue in service initially, and with upgrade or replacement up to the industry team, required a great deal of dialogue between the teams and the Coast Guard with respect to team status. This eventually resulted in the Coast Guard issuing an addi-tional guidance document known as the Legacy Asset Baseline 2002. The Coast Guard described for the teams the existing IDS consisting of all white cutters 110 feet and up, all aircraft, and the associated C4ISR and support structure for these systems. As required by the RFP, the proposed IDS performance could not be less than the measured performance of the legacy system. Therefore, a solid understanding of the legacy Coast Guard was essential to the systems engineering process in defining a new IDS.

Phase 1 tasks expanded during Functional Design with several significant deliverables such as: Concept of Operations (CONOPS); Integrated Master Plan (IMP) and Integrated Master Schedule (IMS); Implementation Plan; C4ISR Architecture, Surface, and Aviation Asset Designs (with varying levels of detail, depending on introduction dates); Integrated Support Plans (ISPs) for all assets; Total Ownership Cost (TOC) and Life Cycle Costs (LCC) estimates; and significant modeling data to support evaluation of operational effectiveness. Phase 1 included several design iterations, usually milestoned by a Program Review with the Coast Guard. Each design iteration was defined by a "baseline configuration" in the context of operational effectiveness and cost. Between reviews, several "additional internal baselines" were developed as the systems engineering design spiral continued to refine the solution.

In such a performance-based acquisition, measuring operational effectiveness is critical to success; therefore, its accurate measurement required modeling. To model system performance, we defined the "what, when, where, and how" for the system to be employed. This required the development of a comprehensive CONOPS, including detailed site-by-site implementation plans and asset deployment schedules for the system and all its assets over the 20-year implementation period. This was no small task,

requiring an in-depth understanding of current Coast Guard missions, doctrine, and tactics. Critical to CONOPS development was a thorough understanding of the Surveillance, Detection, Classification, Identification, and Prosecution (SDCIP) sequence common to all Coast Guard missions. Military leaders often talk of the "kill chain", and for most Coast Guard mission executions it is the SDCIP chain with boats, aircraft, or boarding parties serving as the "weapon" for the endgame, as emphasized by one Commanding Officer who told us *"Boats are my main battery."* The teams were given complete discretion in structuring their proposed SDCIP chain and in selecting the appropriate asset or assets for each stage. For example, they could have selected an all-satellite approach for surveillance and proposed satellite assets to meet this requirement.

A sophisticated model was developed, to measure performance against the Coast Guard standards defined in the MSMP, and to gain insight into such things as system or asset capability deficiencies, SDCIP shortfalls, or regional imbalances. Adjustments based on modeling results generated system changes, as did regular interaction with Coast Guard Technical Assistance Teams and periodic formal Interim Program Reviews where design concepts were presented to the Coast Guard. Each sequential baseline represented a refinement in the overall system solution, always in the context of maximum operational effectiveness and minimum TOC.

Critical to the team's systems engineering process were trade studies and additional analysis to support design concepts. A few significant examples include:

- **Maritime Patrol Aircraft (MPA) Selection.** Recognizing the opportunity for cost savings and improved operational effectiveness, several "candidate" aircraft were evaluated as alternatives to the legacy fixed-wing patrol aircraft. A rigorous operational and cost analysis determined the CASA 235 as the best aircraft for the MPA role to replace the entire fleet of legacy HU-25s and many of the HC-130s.

- **Patrol Boats.** A Coast Guard without patrol boats is **impossible** to imagine. We concluded the 40-year requirement for them could not be satisfied with one generation of patrol boats. This, coupled with a strong need for early improvements within the notional funding constraints, led us to the concept of renovating the existing 110-foot WPBs with dramatically improved habitability, an additional 13 feet, and a stern ramp for small boats. These upgrades will be done quickly, and this upgraded WPB will serve until replaced by a newly designed vessel later in the program. Teammate Bollinger will lead this effort and will have provided all the Coast Guard's patrol boats when the 87-foot CPB program is completed.

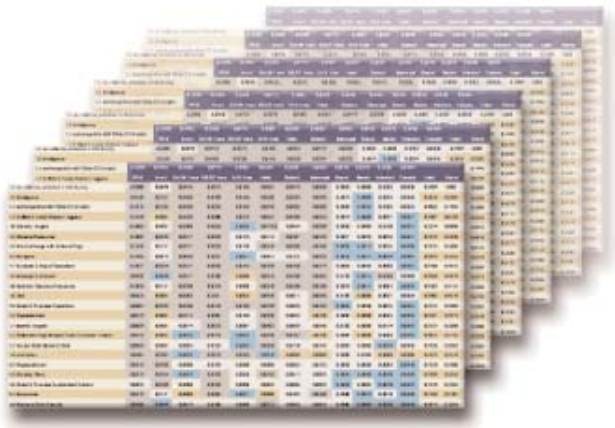
- **Surface Force Mix.** While the RFP allowed considerable latitude in asset recommendations, it specifically required a National Security Cutter (NSC) with some characteristics defined. The MSMP national defense scenarios required both an NSC and a patrol boat with capabilities equal to or greater than a 110-foot WBP. Surface assets are key in several aspects of the SDCIP chain, specifically the "P" for prosecution. Our team examined aviation-deployed endgame solutions and found some promising possibilities, but absent any breakthrough technologies, we concluded a mix of surface and aviation assets was the best starting point for our IDS solution. While this conclusion is hardly surprising, the process was a necessary step to ensure all alternatives were examined. The number of NSCs drive the surface-asset costs. Using the MSMP requirements, we determined that eight NSCs are required. We then conceptually examined solutions with other numerical combinations of NSCs and WPBs, but found all unacceptable due to cost or operational effectiveness considerations. We

needed a third, less costly than the NSC cutter, to bridge the gap between the NSC and WPB - one that provides good endurance, a capability to launch helicopters, VUAVs, small boats, and with an extensive C4ISR suite. This third cutter class became our Off Shore Patrol Cutter (OPC), essentially equal to the NSC in its basic non-DoD Coast Guard mission performance.

- **Ship Motion for Stern Ramp and Aviation Support.** Successful use of stern ramps for launch and recovery of small boats was well documented, especially in smaller vessels such as the Coast Guard 87-foot CPBs. To prove the concept was equally valid in larger ships, the team conducted exhaustive ship motion studies in various sea states to validate the concept and reduce risk associated with this design. Ship motion studies also provided valuable insight into the stability for ship-board aviation operations.

- **Crew Workload and Fatigue Studies to Support Crew Size Recommendations.** Critical to driving down operating expense was reducing crew size where possible. This analysis was necessary to substantiate that the operating crew size was indeed adequate to run the ship in all operations.

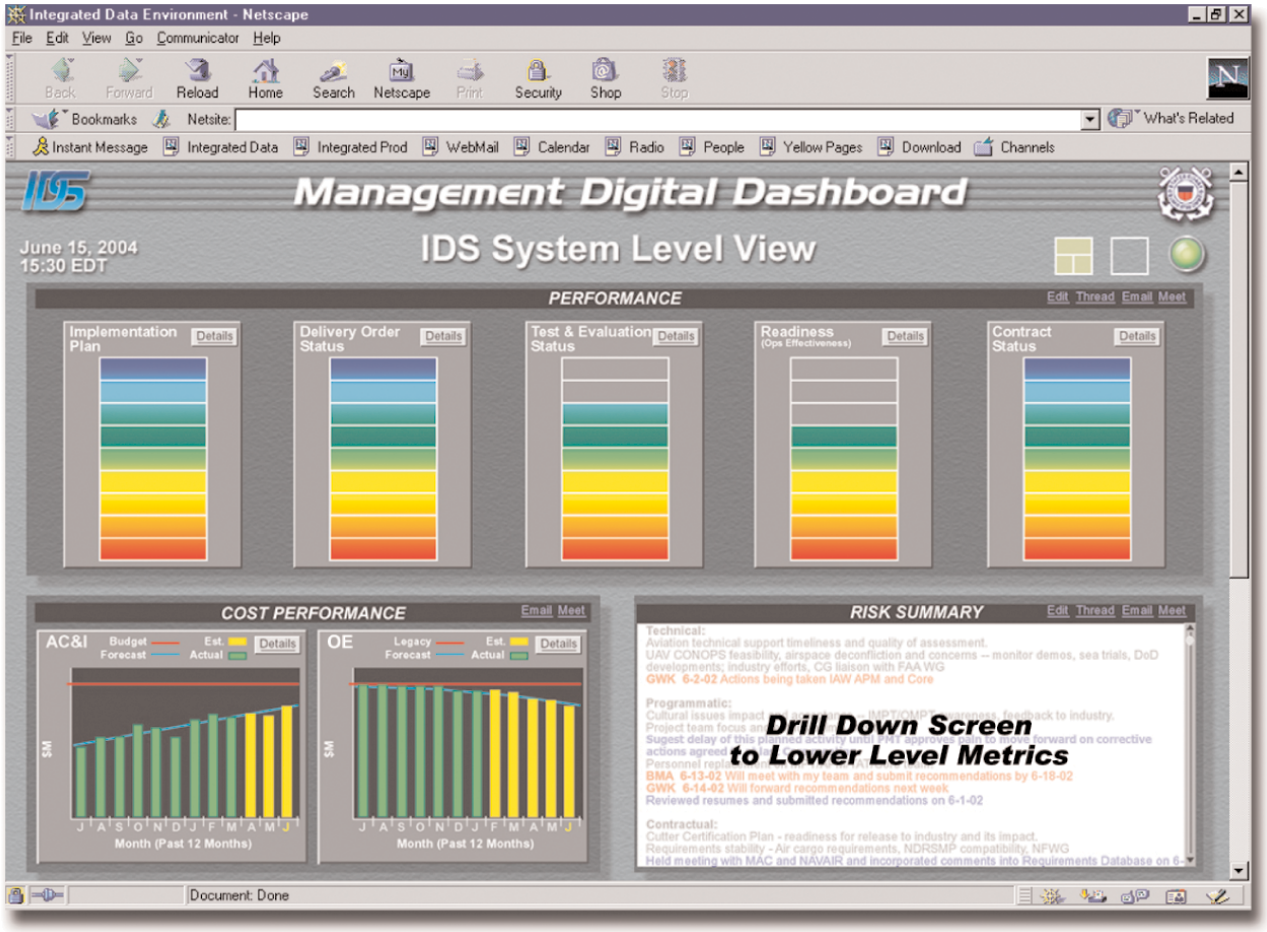
- **Alternative Crewing Concepts.** Various crewing alternatives were evaluated in trade studies and the concept of using an augmented crew, approximately 20 percent larger than the operating crew, appeared attractive. This permitted decoupling cutter OPTEMPO and crew PERSTEMPO, thus increasing cutter days away from homeport to the level where the cutter was physically capable of providing **increased** platform OPTEMPO **without increasing** crew PERSTEMPO from the current level.



What is the ICGS IDS Solution?

The proposed system represents the ICGS best response to the RFP set in the context of the current acquisition documents. This balances the program's interrelated goals of maximizing operational effectiveness and minimizing TOC. As described earlier, the Coast Guard provided notional funding profiles for both AC&I and OE budgets, and the teams were constrained to work within those profiles in developing their solution. This most likely influenced the resultant system more than another other single requirement. Without those constraints, especially the level annual distribution, a different solution, quite possibly with greater operational effectiveness and at a lower TOC, may have resulted. With that said, the proposed solution is considered optimized given these criteria **at this time**. The system design could, and most likely will, change over time. The challenge is to create a system and management process with sufficient flexibility to adapt to new requirements. An output of the acquisition process is a set of excellent tools to compare all the facts of projected changes.

The ICGS management philosophy embraces full participation and partnership with the Coast Guard at all levels, and with the right people, processes, and tools to accomplish the jobs. Lockheed Martin and Northrop Grumman formed the ICGS joint venture for the specific purpose of providing the Coast Guard with single-point accountability for all IDS activities, and with direct access to a com-bined system integration and shipbuilding organization. Key leadership personnel from Phase 1 became the core of the joint-venture leadership.



Key management processes are supported by appropriate documentation. These include the Integrated Management Plan and the Integrated Master Schedule that, together, define the processes and schedule for all contract milestones. Task and Delivery Order management defines all work scope parameters to support execution. There are individual Statements of Work and more than 150 Delivery Orders planned for the initial five years, with 39 detailed Work Plans ready for Year One. Project control is ensured by using a Risk Management Plan, Subcontractor Management Plan, and Earned Value Management System. Tools to support all management activities include a "digital dashboard" for program visibility, theater and campaign-level models, and integrated Life Cycle Cost tools for trade studies.

The proposed IDS solution is composed of:

- Legacy Upgrades
- C4ISR Systems
- New Assets
- Integrated Services

Legacy Upgrades. Key legacy upgrades include a 15-year service life extension to 49 110-foot patrol boats. Primary enhancements include lengthening the boat to 123 feet with a stern ramp, new pilothouse, habitability improvements, and replacement of shell plating as needed.

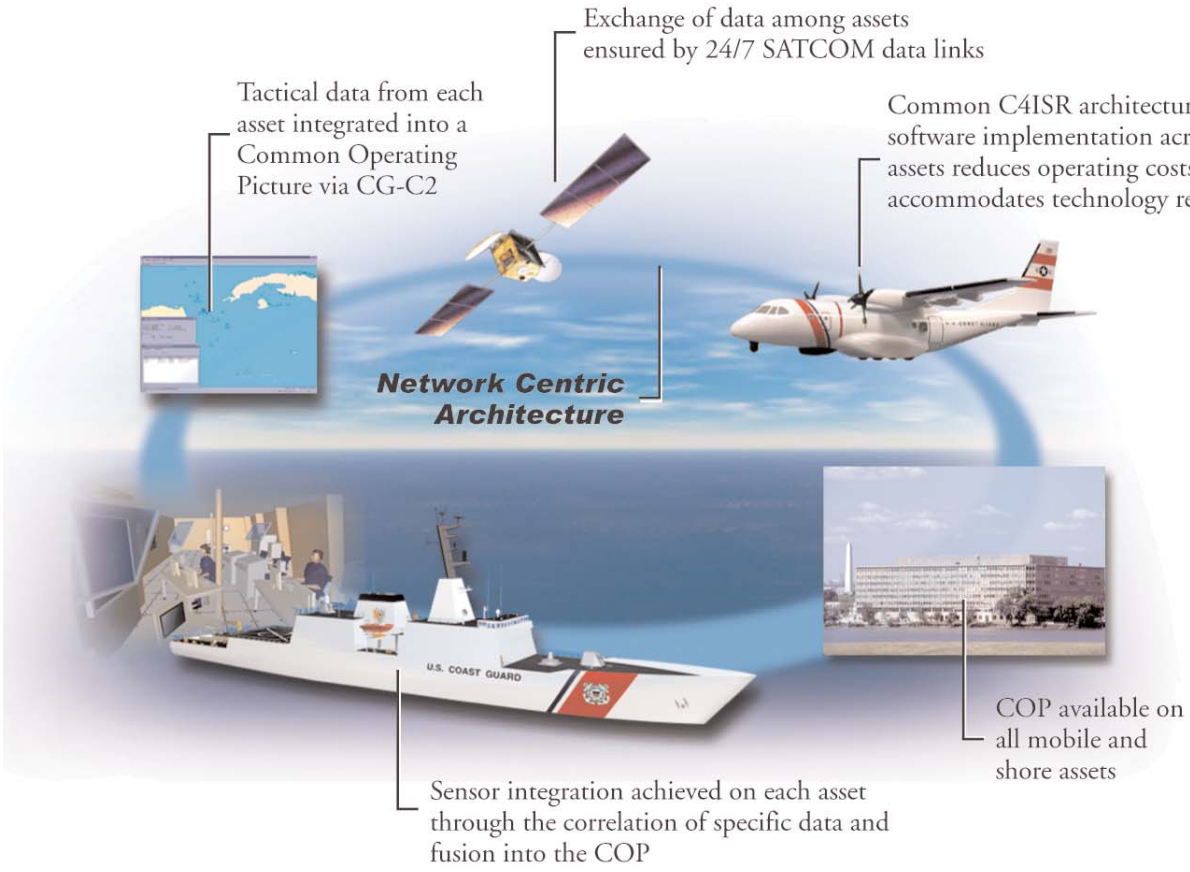
Some legacy cutters will be equipped with standard Alien Migrant Interdiction Operations (AMIO) shelters and provisions to support Vertical Unmanned Air Vehicle (VUAV) operations. Sensors and communications will be upgraded and added to enhance communications, interoperability, and detection capability. An inport security system will automate monitoring and support security.

The HH-65 will receive a major mid-life upgrade to become the Multi-mission Cutter Helicopter (MCH). The modification will take advantage of advances in technology and increase mission capability. The HC-130, expected to remain in service for some time, will receive command and control system upgrades. (As noted earlier, our solution is the starting point based on the acquisition docu-ments issued at the outset. During the acquisition, many things have happened that must ultimately be incorporated. For example, supplemental funding from outside the Coast Guard has been provided to add six C-130Js to the Coast Guard inventory. Obviously, these will eventually become part of the IDS.)

C4ISR Systems. An asset-independent C4ISR architecture defines interoperability and integration of sensors, communications, infrastructure, weapons, and support systems. Command and control (C2) for all IDS assets and shore facilities provides a Common Operating Picture (COP). C4ISR, at the asset level, uses modular system elements that are easily upgraded and includes equipment commonality to reduce maintenance and training requirements. (The acquisition documents mandated maximum use of Commercial Off The Shelf (COTS), Government Off The Shelf (GOTS), and Non Developmental Items (NDI)).

Key capabilities and benefits associated with C4ISR systems are:

- **Full Integration.** Command, control, and computers are fully integrated with all sensors, communications, and legacy interfaces. This links mobile and shore assets to enable C2 and logistic support. Strategic, tactical, and management information is easily accessible, thereby enhancing Maritime Domain Awareness.
- **Communications Reliability.** Communications systems are based on off-the-shelf technologies, including INMARSAT, and allow broad-spectrum,



Surface Assets

Asset	Quantity	Characteristics	Date
NSC*	8	425'/3686 LT/ 28 kts max Crew: 82 / Berth: 118 SEARAM; 57 mm; 50 caliber	2006-2013
OPC	25	341' / 2921 LT / 22 kts max Crew: 73 / Berth: 94 Stabilized 30 mm; 50 caliber	2012-2022
FRC	58	130' / 198 LT / 30 kts max Crew: 15 / Berth: 19 Stabilized 30 mm; 50 caliber	2018-2022
LRI	42	11 meter / 45 kts 14 person	2006-2022
SRP	82	7 meter /36 kts 10 person	2003-2021

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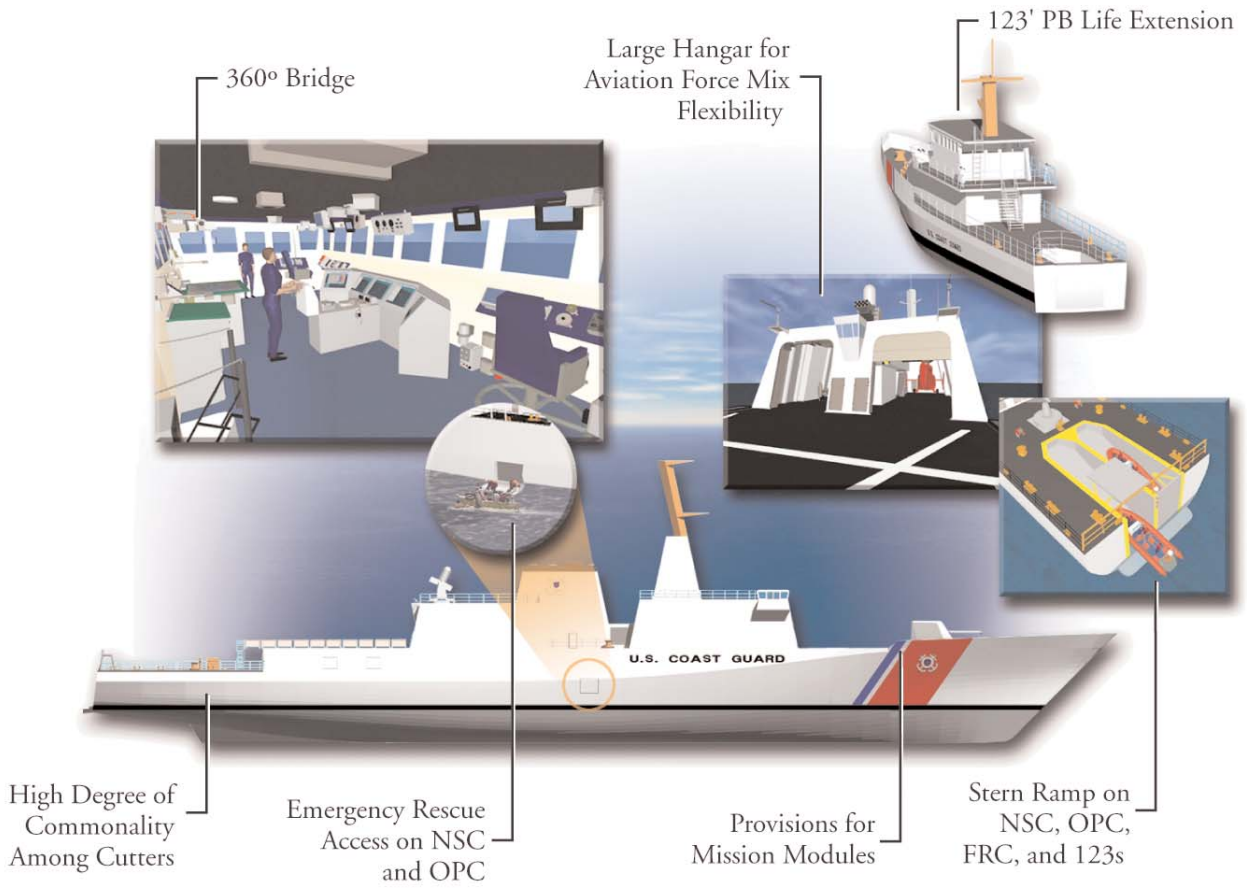
National Security Cutter (NSC)
Offshore Patrol Cutter (OPC)
Fast Response Cutter (FRC)
Long Range Interceptor (LRI)
Short Range Prosecutor (SRP)



reliable, and integrated communications for Line of Sight (LOS) and Over The Horizon (OTH) operations.

- **Improved Connectivity.** Intelligence sharing is enhanced with improved connectivity to external agencies, and intelligence data is integrated into the COP. Additionally, ICGS plans internal investment to develop a tactical intelligence center in the first five years.

- **State-of-the-Market Detection.** Surveillance and reconnaissance is improved with state-of-the-market detection systems (radar, EO, FLIR) on surface and aviation platforms fused into one COP.

New Assets. New IDS assets will be phased in over the 20-year implementation.

Key capability improvements and benefits associated with the surface assets include:

- Three new cutter classes designed from the keel up to meet USCG missions, maximize commonality in operations, equipment, training, and logistics, and reduce design and construction costs.

- Augmented crews on cutters to provide 25 percent more mission days without increasing days away from homeport per sailor.

- Provisions for interchangeable Mission Modules on the NSC and OPC enhance flexibility tailored to missions. Stern ramps on all cutters and upgraded 123-foot WPBs enhance small boat launch and recovery operations with reduced crews.

Aviation Assets

Asset	Quantity	Characteristics	Date
MPA*	35	EADS CASA HC-235 Range 3055 nm Speed 235 max, 208 cruise Annual flight hours 1200	2005-2012
VUAV	69	Bell HV-911 Eagle Eye Tiltrotor Range 750 nm Speed 220 max, 157 cruise Annual flight hours 1200	2006-2018
VRS	34	Agusta-Bell AB139 Range 511 nm Speed 165 max, 155 cruise Annual flight hours 800	2014-2022
MCH	93	EADS HH-65X Range 420 nm Speed 165 max, 145 cruise Annual flight hours 700	2007-2013
HAEUAV	7	Northrop Grumman RQ-4A Endurance >30 hours Speed 343 max, 343 cruise Annual flight hours 2300	2016

*

Maritime Patrol Aircraft	(MPA)
Vertical Takeoff and Landing (VTOL) Unmanned Air Vehicle	(VUAV)
Vertical Recovery and Surveillance Aircraft	(VRS)
Multi-mission Cutter Helicopter	(MCH)
High Altitude Endurance Unmanned Air Vehicle	(HAEUAV)

- An overall 30-percent reduction in NSC/OPC crew size through systems automation and design, as compared to legacy major cutters, lowers operating costs.
- 360-degree bridge enhances operational awareness and safety.
- Dramatically improved habitability includes two and four-person staterooms, fitness centers, lounges, and training centers.
- Dual-gender accommodations enable flexible crew assignments.
- System automation reduces watchstander workload.
- CODAG propulsion on the NSC improves fuel efficiency by 26 percent.
- Stability systems enable small boat and air operations in high sea states.
- Emergency rescue access doors on the NSC and OPC improve at-sea transfer of personnel.
- A large, dual-helo capable hangar allows flexible helicopter and VUAV aviation force packages.
- LRI communications, sensors, and navigation extend prosecution capability over the horizon.

Key capability improvements and benefits associated with the aviation assets include:

- Night/all weather capability with radar and electro-optical/infrared (EO/IR) sensors.
- Cutter-based VUAVs offer speed, range, and endurance, at a very low cost, and significantly increase the cutter's organic aviation capability.
- An MPA, already proven in the maritime

environment, that flies more hours at significantly lower cost than the HC-130 or HU-25.

- The legacy HH-65 upgrade to the MCH represents a virtually new aircraft with avionics common to the VRS.
- Distant, expansive, and multiple surveillance areas can be covered by the HAEUAV capability of 30-hour missions.

Integrated Services. To capitalize on the system-of-systems approach, systems engineering and integration and integrated logistic support are the products that ensure system availability and performance. This will require exceptional cooperation between the Coast Guard and ICGS. ICGS will be responsible for supporting new assets, as well as some legacy assets, and for carefully integrating such new assets with the non-Deepwater Coast Guard, while capitalizing on business process improvement opportunities where appropriate. The relationships between Deepwater and non-Deepwater systems received exceptional attention as ICGS designed its approach. The IDS solution consumes less than one-third of the Coast Guard's Operating Expense and uses less than one-fourth of its people. Obviously, the two systems will need to be carefully coordinated.

Key features are:

- A Logistics Information Management System (LIMS) installed on all Deepwater cutters, including most legacy platforms, and at shore operational, C4, and support facilities, integrates all logistics data in maintenance, training, personnel, supply, etc. LIMS will also be integrated with several existing legacy logistics systems.
- A Mission Capability Assessment System (MCAS), interfaced with LIMS, to provide operational commanders at all levels with immediate readiness assessments of their forces.
- Supply support is based on establishment of

Performance Based Logistics with 65 percent of the supplier base and is integrated with maintenance and contractor strategies. Warehousing is reduced through contractor support and total asset visibility.

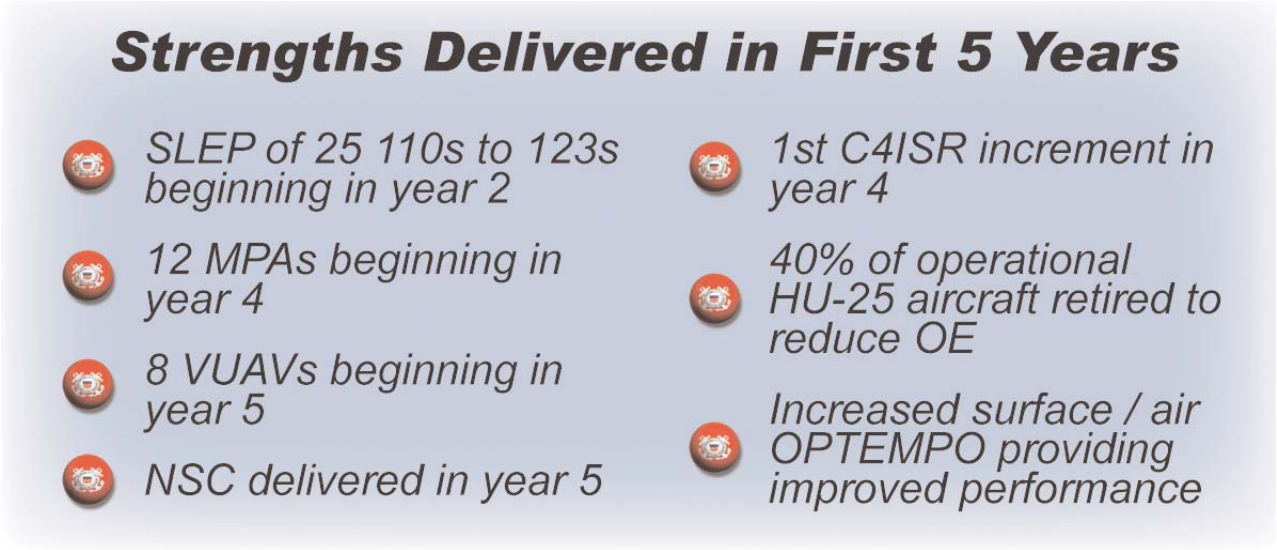
- The reliability-based maintenance philosophy uses condition-based monitoring and maintenance. Response to critical failures is a top priority, and overall maintenance availability time required to conduct repairs is reduced. Maintenance aids such as Personal Digital Assistants (PDAs) are widely used.
- Modernization is achieved with technology refresh and insertion and reduces the engineering change time.
- Training advances include distance learning and computer-based training.

The Coast Guard and all contractors share Configuration and Data Management (CM/DM) with full access. This common, systemwide CM/DM means that data is developed once and used many times, thus saving development costs over traditional processes.

What are the Benefits and Impact of "Deepwater"?

The ICGS solution provides steady increases in operational effectiveness and reductions in operating expense throughout the 20-year IDS implementation. It is designed to produce significant benefits in the first 5-year base contract period, compared to legacy systems. During this time, the first NSC is introduced - designed from the keel up to meet Coast Guard missions - along with new unmanned air vehicles, MPA, and a 15-year life extension to the 110-foot WPBs. The 20-year implementation provides for increased and more effective mission hours, at lower operating costs per hour, compared to today's systems. Early incorporation of Coast Guard Resource Proposals for planned asset upgrades will ensure that the legacy surface and air fleets are sustained to allow timely implementation of new assets. The first contract period of five years will be busy. As stated earlier, there are more than 150 Delivery Orders for the first five years with 39 Work Plans in the initial year. The following significant events will occur:

- Complete detailed design and upgrade of 110-foot WPBs to 123-foot WPBs, with the first cutters beginning in FY2002, and a total of 25 completed in the first five



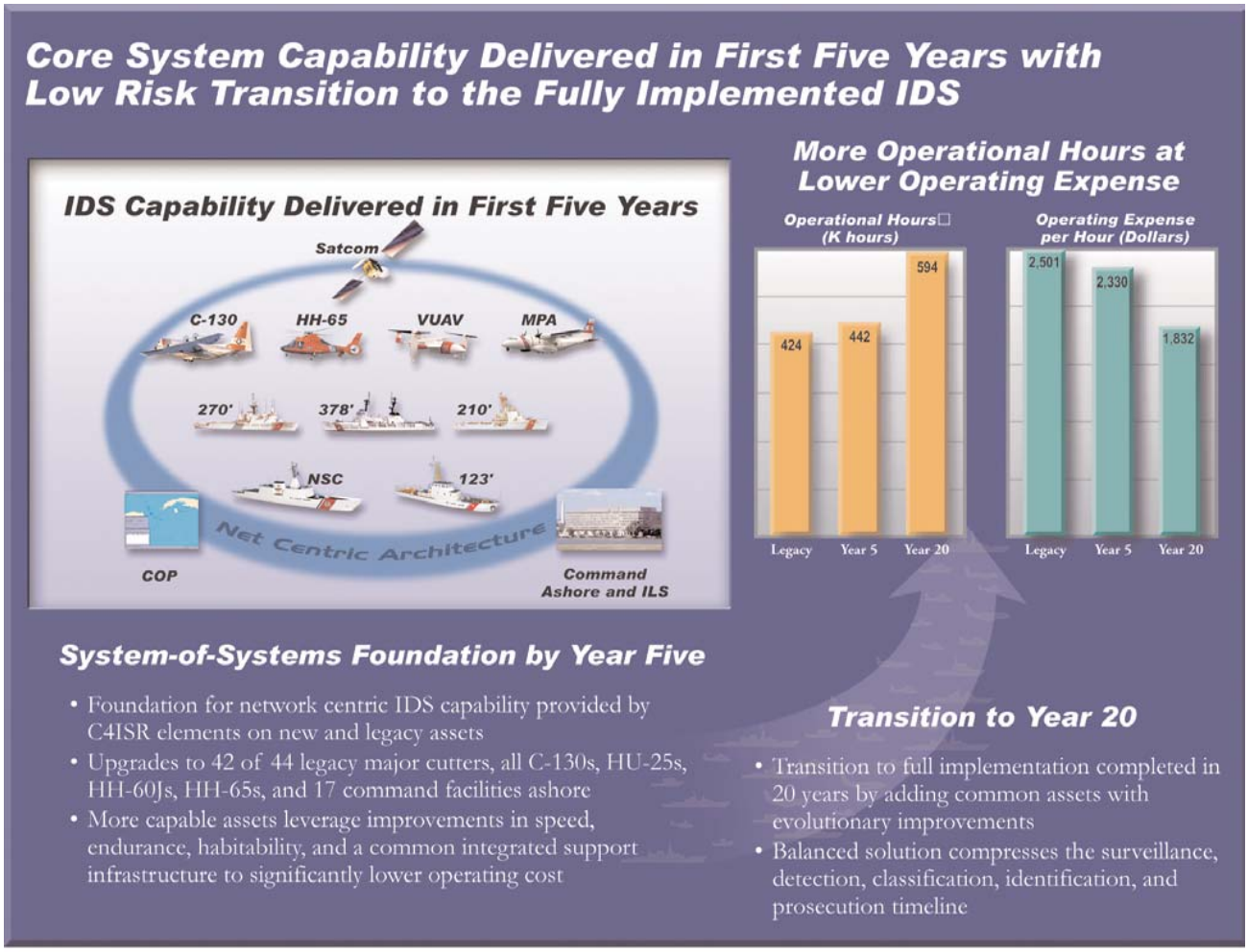
years. This provides more efficient boat operations with a stern ramp and new boat; updated pilothouse; integrated sensors, communications, and C2 systems; and enhanced habitability.

- Upgrade of six WHECs with C2 and communications systems to support INMARSAT, AIS, and boarding party devices for improved operations beginning in year one.
- Adapt MPA for Coast Guard mission requirements, including increased fuel capacity, mission sensors and communications package, and deliver 12 MPAs beginning in year four.
- Conduct and refine detailed design for the NSC and conduct trade studies and analysis for propulsion system, combat system, survivability, logistic requirements, and small boat selection and integration. Order long lead materials and deliver the first NSC in year five.
- Refine design for the Coast Guard Common C2 system and deliver the first C4ISR increment in year four.
- Initiate upgrade of Communications Area Master Stations (CAMS) to support connectivity with new and upgraded assets.
- Initiate upgrade of logistic support sites with hardware and software, including Integrated Product Data Environment (IPDE) and pre-production prototype of Logistic Information Management System (LIMS).
- Conduct analysis and detailed design of the VUAV for Coast Guard missions and deliver eight air vehicles with control stations beginning in year five.
- Upgrade the simulator at ATC Mobile.

When fully implemented, gains in operational effectiveness and cost reductions will be more dramatic over time. The Center for Naval Analysis IDS Asset Assessment Tool (CIATT) was selected by the Coast Guard to quantify operational effectiveness. Based on CIAAT electronic modeling data, regional search, identify, and prosecute scores show steady performance increases throughout the transition years. Total prosecution scores, representing endgame capability, range from 4.9 to 7.0 times more effective than the legacy system. The objective of the IDS is to focus resources on high-value targets of interest to compress the SDCIP mission sequence and provide more effective mission hours.

In addition to CIAAT, operational effectiveness was validated by using a more robust, probability-based theater and campaign model called Naval Surface Simulation - Peacetime Engagement (NSS-PE) tailored specifically for Deepwater from a Navy model. The IDS performance was modeled and validated against Coast Guard mission Measures of Effectiveness (MOEs) given in the MSMP, and again scored greater than the legacy system in all critical-mission areas. The model will continue to be refined and used to support modifications to the implementation approach driven by funding, technical, and mission changes.

Another comparison to the legacy system, in terms of overall capacity, is that the end-state IDS will produce an 8-percent increase in major cutter mission days with a fleet of 33 newly designed major cutters. Annual Deepwater patrol boat hours will increase nearly 78 percent above the legacy system and use larger, more capable



patrol craft. Manned aircraft operating hours will increase about 2 percent with 20 fewer manned aircraft; but more importantly, an additional 95,300 flight hours will be produced annually by unmanned aircraft, thus resulting in a total aviation capacity nearly 80 percent greater than legacy.

ICGS plans to reduce risk by continuing to implement an aggressive investment plan. For Phase 2, ICGS has committed more than $55 million, outside the scope of the contract, to continue investing in risk reduction during the first 5-year base contract period. Focus areas for this investment include command and control software, integrated modeling and simulation tools, composite shipbuilding materials, and modular ship production.

Additionally, at no cost, a prototype intelligence data fusion center will be provided to the Coast Guard for its evaluation as a potential technology insertion capability during Phase 2.

Furthermore, IDS, although dramatic in scope, preserves the Military, Maritime, Multi-Mission character of the Coast Guard. There is no proposed change in the command and control organization of the Service. As mentioned earlier, new support philosophies and procedures are expected as new business processes are incorporated and as new assets come online. Whatever changes are made, they will come about through mutual agreement in an evolutionary partnership. There will not be early and dramatic reductions in personnel, and this process will neither threaten the Coast Guard's core competencies nor its management and control of the support system.

New assets require fewer people to operate and maintain, therefore, as legacy assets are phased-out and new assets come online, there will be a

gradual overall reduction in personnel required for the IDS. Experience has shown minimum crewing runs aground when the promised shore infrastructure is not provided (because of budget or other problems). Therefore, the supporting shore infrastructure must be provided.

What's Ahead?

Critical to what happens after contract award is the advance planning and investment made with pre-award preparations. Significant detail was required by the Phase 2 RFP to substantiate system design, implementation, support, and cost, to reduce risk associated with program execution. Above and beyond those requirements, ICGS committed additional investment to ensure a fast start on Day One of the contract. ICGS developed a "First 100 Day Plan" to ensure effective start-up including the release of the first Task and Delivery Orders.

Given that the system proposed is one based on the acquisition documents (RFP, SPS, MSMP, LAB 2002, etc.) prepared previously, it is certainly expected that updated information, not only about the legacy Coast Guard, but equally important, changed national and Service priorities driven by world events, will need to be examined for impact on the system design, configuration, and implementation. Fortunately, much of the preliminary effort has been accomplished by ICGS, especially with regard to Homeland Security initiatives, in anticipating these changes and providing systems engineering and management processes to implement and manage change. Additional information gathering will most likely be necessary and, accordingly, ICGS plans to work closely with the Coast Guard Program Staff.

Most significant will be the anticipated change in contract communications protocol. Throughout the competitive phases, communication was appropriately constrained for competitive fairness and acquisition regulation. Although government/contractor communications will always be governed by regulation, when this contract was awarded on June 25, 2002, it was anticipated that more open dialog will prevail and communications appropriate to the partnership will flourish. In this mutually beneficial environment, opportunities will exist to examine, embrace, and refine ideas that may further enhance system capabilities. Fine-tuning the solution may result.

Managing Expectations

With every decision, there are alternatives. With each of the thousands of design decisions made on this program, several thousand alternatives were examined. The balance between the interrelated goals of operational effectiveness and minimum TOC, in addition to existing budget constraints, required trade-offs and compromise. The goal of ICGS was to conduct those trades and make those decisions with a rigorous, verifiable methodology and process that could be defended and supported over time to the public, the Administration, and Congress.

Deepwater was conceived before 9/11, yet many of the missions performed in the Deepwater environment directly translate to Homeland Security. With that said, the term Deepwater does not serve today's program as well as it might, and probably needs revision to bring it more in line with today's realities. The fundamental premises are still valid and the system will serve the Coast Guard well, especially with respect to Homeland Security.

Additionally, significant opportunities exist with other Coast Guard systems designed to operate in the inland and coastal environments. Ports and Waterways Safety System (PAWSS) is under contract and being fielded. The National Distress and Response System (NDRS) is in proposal evaluation with award expected in September 2002. These systems also provide many of the same capabilities, especially with regard to command and control, which the Deepwater system provides. A magnificent opportunity exists for

linking these systems and expanding the sharing of operational and support information. This will improve not only operational effectiveness, but availability and support metrics as well.

The Deepwater Program enables the Coast Guard to fulfill its National Fleet commitments. The Coast Guard is currently struggling to be an effective participant in surface deployments with the Navy, but the Deepwater Program will change that. It will provide state-of-the-market platforms with the necessary speed, agility, and flexibility to deploy with and respond to crises alongside the U.S. Navy. Deepwater will transform Coast Guard assets from a fractured, platform-centric force to a linked, network-centric system-of-systems.

Deepwater mandates full interoperability with the Navy and NATO allies (e.g., C4ISR architecture). The National Security Cutter will be designed for crisis response and smaller-scale contingency missions required of shallow draft warships in low-threat environments. It will be capable of operating with naval surface combatants in order to complement naval capabilities for full-spectrum warfare. The Navy has been, and will continue to be, active particpants in the Deepwater Program (e.g., test and evaluation, technical expertise, requirements formulation, research and development, and cost analyses).

Validation of the acquisition strategy and the need for Deepwater was always a concern. Diligence required appropriate studies to ensure the public's interests are being well served. In December 1999, the Interagency Task Force on Coast Guard Roles and Missions provided its report entitled "A Coast Guard for the Twenty-First Century." The report focused on long-term maritime issues facing the nation, and the challenging environment in which the Coast Guard expects to operate in the year 2020. This report also projects the range of vital roles and missions that the Coast Guard will perform to support national policies and objectives that will endure into the 21st Century. The Task Force agreed on six overarching conclusions that validate the Coast Guard's roles and missions, as well as the Deepwater Program:

- The Coast Guard's roles and missions support national policies and objectives that will endure into the 21st Century.
- The U.S. will continue to need a flexible, adaptable, multi-mission, military Coast Guard to meet national interests and requirements well into the next century.
- In order to hedge against tomorrow's uncertainties, the Coast Guard should be rebuilt so as to make it adaptable to future realities.
- In keeping with its well-deserved reputation as one of federal government's most effective and efficient organizations, the Coast Guard should continue to pursue new methods and technologies to enhance its ability to perform its vital missions.
- The re-capitalization of the Coast Guard's Deepwater capability is a near-term national priority.
- The Deepwater Program is a sound approach to that end and the Interagency Task Force strongly endorses its process and timeline.

So far, budgetary support for the IDS Program appears solid at the projected $500 million annual AC&I level (FY 98 dollars). This rate will neither provide a quick fix nor allow the Coast Guard to get well soon; however, it is a good start. Funding is the driving force for the implementation schedule; enough capacity exists to reach an end state much more quickly, if given accelerated funding support.

In our article, we have tried to show that the proposed solution is optimum within the guidance provided by the acquisition documents, with their strong emphasis on operational effectiveness, TOC, and the constraints of the notional OE and AC&I funding profiles. In its proposal, ICGS sought to balance these objectives and to

walk the fine line between reach and risk. Our solution is sufficiently flexible to accommodate changes in emphasis on any of the driving requirements.

We noted, several times, our extraordinary outreach efforts to Coast Guard men and women during the past five years. Response has been exceptionally enthusiastic and helpful. ICGS will continue the outreach program under the guidance of the Coast Guard Program Office. The Deepwater System must evolve based upon good solid inputs from its users through the normal chain of command. ICGS looks forward to this essential dialogue. ICGS is also fully committed to the Coast Guard's success and expects to remain a partner with the Coast Guard for many years to come.

ICGS is "singled up, awaiting orders."

Semper Paratus.

Authors' note: As mentioned earlier, our outreach efforts began more than five years ago and included the participation of retired Coast Guard people from every background. Many worked directly for the companies that comprised the ICGS team, while others served as consultants from nearly full-time to occasional involvement. Without exception, their participation was critical to the success of ICGS, and we thank all of them immensely.

We also believe a large part of ICGS's winning solution can be attributed to the Coast Guard men and women on the other side of our outreach efforts. The handful of retired personnel on our team who have led that effort from the early days of the project appreciate your participation.

Despite considerable skepticism from many fronts, the Coast Guard, led with exceptional vision and strong perseverance by several Commandants, has been successful in defining its requirements, conducting a successful acquisition, and setting a funding stream in place to support re-capitalization of its major assets. This is a very significant achievement. Rough seas and shoal waters surely lie ahead as they did in Secretary Hamilton's day and the times between then and now. As always, these represent opportunities for Coast Guard men and women, not impediments.

The Coast Guard has considered itself a "family" organization for years; this has been one of our many strengths, but families have a well-developed tendency to fend off those wanting to join. The Coast Guard now has a new partner who is essential to its success. ICGS needs to be welcomed into the family. Please work with them and within the Coast Guard to ensure Deepwater is the success it can be. As for us, this part of our job is done. Birdies and fish have been neglected for too long.

RADM Gilbert, Ret. USCGA '58 and Captain McGuffin, Ret. USCGA '70 supported Lockheed Martin NE&SS-Surface Systems in Moorestown, N.J., in its pursuit of the IDS Program during the past five years. RADM Gilbert is President of Gilbert & Associates, Inc. and Captain McGuffin is a Senior Associate in the company. Gilbert & Associates, Inc. provided more than twenty retired Coast Guard personnel for various times as consultants in pursuit of the IDS Program. These included a Flag Advisory Group headed by VADM Roger Rufe, Ret. USCGA '65. The company also supported Lockheed Martin NE&SS-Radar Systems in Syracuse, N.Y., in its pursuits of the Coast Guard's Ports And Waterways Safety System (PAWSS) and the National Distress and Response System (NDRS). The Syracuse group won the PAWSS implementation contract and one of three design contracts for the NDRS. The Coast Guard is in the final stages of evaluating them and one other company for the implementation contract.